WHAT IS CLAIMED IS:

1. A method of setting up an automatic defect classifier system for classifying semiconductor defects, the method comprising:

providing defect image data for a plurality of defects;

selecting a representative set of defects from the defects so as to optimize manual classification; and

presenting the representative set of defects and not the defects which are not part of the representative set to a user for manual classification, wherein the defects which are not part of the representative set are defined as non-reviewed defects.

2. A method as recited in claim 1, further comprising:

(a) determining a probable class for each non-reviewed defect based on a seed set which is manually classified by the user;

(b) determining a representative set of defects from each probable class which include defects having a probable class with a lowest confidence level within such probable class;

(c) presenting the representative set of defects from each probably class to the user for possible re-classification; and

(d) repeating steps (a) through (c) until all defects within the representative set of defects from each probable class have a same class, wherein the repetition of the determination of the probable class is based on the manual classifications and the re-classification by the user.

3. A method as recited in claim 1, further comprising grouping the defect image data into a plurality of groups of one or more defects, wherein a representative set if selected and presented from each group.

4. A method as recited in claim 1, further comprising determining whether manual classification is present already for some of the defects the representative sets are presented only when there is no manual classification present.

5. A method as recited in claim 1, wherein each representative set of defects is a manageable subset of defects from the total defects.

6. A method as recited in claim 3, further comprising selecting a total number of the groups into which the defects are groups.

7. A method as recited in claim 3, wherein the total number the groups is user selectable or adjustable.

8. A method as recited in claim 1, wherein determining the representative set of defects includes selecting only a single defect from among defects which are substantially similar to be included within the representative set.

9. A method as recited in claim 1, wherein determining the representative set of defects includes selecting defects which are uniformly distributed across a feature space to be included within the representative set.

10. A method as recited in claim 1, wherein determining the representative set of defects includes selecting defects which are the most diverse to be included within the representative set.

11. A method as recited in claim 1, wherein determining the representative set of defects comprises:

when the defects total less than three, selecting all of the defects to be included within the representative set; and

when the defects are equal to three or more, selecting defects based on the max/min algorithm until ¼ of the defects are selected.

12. A method as recited in claim 3, wherein determining the representative set of defects comprises:

when the defects for the each group total less than three, selecting all of the defects from the each group to be included within the representative set for such group; and

when the defects for the each group are equal to three or more, selecting defects from the each group based on the max/min algorithm until ¼ of the defects are selected.

13. A method as recited in claim 3, further comprising:

classifying the non-reviewed defects using each groups manual classification when all the groups each have defects having the same manual classification, and wherein operations (a) through (c) are only performed when all the groups each fail to have defects having the same manual classification.

14. A method as recited in claim 13, wherein the defects are grouped and classified using a natural grouping procedure.

15. A method as recited in claim 13, further comprising:

including the defects having manual classifications in a seed set of defects, wherein the probable classes are determined based on the seed defects; and

adding any re-classified defects into the seed defects when all defects within the representative set of defects from each probable class fail to have a same class prior to repeating operations (a) through (c).

16. A method as recited in claim 15, further comprising:

updating the number of probable classes if changed by the user when all defects within the representative set of defects from each probable class fail to have a same class prior to repeating operations (a) through (c); and

modifying each manual classification that has been changed by the user when changed by the user when all defects within the representative set of defects from each probable class fail to have a same class prior to repeating operations (a) through (c).

17. A method as recited in claim 15, the method further comprising:

adding any re-classified defects into the seed defects even when all defects within the representative set of defects from each probable class have a same class;

presenting a representative set of suspected misclassified defects to the user for possible re-classification when all defects within the representative set of defects from each probable class have a same class; and

classifying the non-reviewed defects based on the manual classification and re-classification defects of each probable class.

18. A method as recited in claim 2, wherein determining a probable class is based on a neural net procedure.

19. A method as recited in claim 2, wherein determining a probable class is based on a nearest neighbor procedure.

20. A method as recited in claim 2, wherein determining the representative set of defects from each probable class comprises:

determining a confidence level for each non-reviewed defect in each probable class; and

selecting the non-reviewed defects from each probable class which have the lowest confidence level for inclusion in the representative set for such probable class.

21. A method as recited in claim 20, wherein the confidence level for each non-reviewed defect within each probable class is calculated by:

$$confidence\ value = 1 - \frac{d_1}{d_2}$$

where d_1 represents the distance between the unknown defect and its nearest seed defect D_s and d_2 represents the distance between the unknown defect and its second nearest seed defect which has a different manual code than the seed defect D_s.

22. A method as recited in claim 2, wherein the representative defects for each probable class are presented within a user interface which includes a plurality of class identifiers wherein the user can associate selected ones of the representative defects for

each probable class with a specific one of the class identifier to thereby re-classify such associated defects.

23. A method as recited in claim 22, wherein the user associates selected ones of the representative defects for each probable class with a specific one of the class identifier by selecting, dragging, and dropping the selected representative defects onto the specific class identifier.

24. A method as recited in claim 4, further comprising when there is manual classification present:

presenting the defects to the user for review; and

repeating the operations for grouping, selecting and presenting a representative set from each group, as well as operations (a) through (c).

25. A method as recited in claim 4, further comprising when there is manual classification present:

when there is a training set of classified defects for classifying unclassified defects present, using the training set as reference defects to detect new defects in other non-reference defects;

when there is not a training set of classified defects for classifying unclassified defects present, using the classified defects as reference defects to detect new defects in other non-reference defects;

when new defects are found, grouping the new defects and presenting to the user for classification; and

when new defects are found, repeating operations (a) through (c) after the new defects are classified.

26. A method as recited in claim 4, further comprising creating a classifier system for classifying unclassified defects when the user selects an option for creating the classifier system, wherein creating the classifier system comprises:

repeating the operations for grouping, presenting the representative set from each group; and operations (a) through (c), wherein the classified defects are used as seed defects for classifying unclassified defects as part of the classifier system, when the user selects a supervised mode;

using at least a portion of the classified defects as training defects for classifying the rest of the defects as part of the classifier system when the user selects using existing manual classes mode; and

using a grouping procedure for assigning manual class codes to the defects and then using a portion of the defects as training defects for classifying the rest of defects as part of the classifier system when the user selects an unsupervised mode.

27. A method as recited in claim 26, further comprising:

when using existing manual classes mode is selected, presenting purity and accuracy matrices for a classifier based on (1) existing training defects, (2) a training set selected using the max/min algorithm (3) a training set combining the existing training set and a training set selected using the max/min algorithm; and

creating a classifier based on the user's selected from among the three classifiers.

28. A method as recited in claim 25, wherein the grouping procedure is a natural grouping procedure.

29. A method as recited in claim 1, further comprising maintaining a classifier by merging existing classifiers together, adding new type of defects into the classifier, adding new boundary defects into the classifier, and removing redundant defects from the classifier.

30. An apparatus operable to set up an automatic defect classifier system for classifying semiconductor defects, comprising:

one or more processors;

one or more memory, wherein at least one of the processors and memory are adapted for:

providing defect image data;

grouping the defect image data into a plurality of groups of one or more defects;

selecting a representative set of defects from each group so as to optimize manual classification; and

presenting the representative set of defects from each group and not the defects which are not part of the representative set from each group to a user for manual classification, wherein the defects which are not part of the representative set from each group are defined as non-reviewed defects.

31. An apparatus as recited in claim 30, wherein at least one of the processors and memory are further adapted for:

(a) determining a probable class for each non-reviewed defect based on the manual classifications by the user;

(b) determining a representative set of defects from each probable class which include defects having a probable class with a lowest confidence value within such probable class;

(c) presenting the representative set of defects from each probably class to the user for possible re-classification; and

(d) repeating steps (a) through (c) until all defects within the representative set of defects from each probable class have a same class, wherein the repetition of the determination of the probable class is based on the manual classifications and the re-classification by the user.

32. An apparatus as recited in claim 30, wherein determining the representative set of defects for each group includes selecting defects which are uniformly distributed among the group's defects to be included within the representative set for such group.

33. An apparatus as recited in claim 30, wherein determining the representative set of defects for each group includes selecting defects which are the most diverse from the group's defects to be included within the representative set for such group.

34. An apparatus as recited in claim 30, wherein determining the representative set of defects for each group comprises:

when the defects for the each group total less than three, selecting all of the defects from the each group to be included within the representative set for such group; and

when the defects for the each group are equal to three or more, selecting defects based on the max/min algorithm until ¼ of the defects from the each group are selected.

35. An apparatus as recited in claim 31, wherein at least one of the processors and memory are further adapted for:

including the defects having manual classifications in a seed set of defects, wherein the probable classes are determined based on the seed defects; and

adding any re-classified defects into the seed defects when all defects within the representative set of defects from each probable class fail to have a same class prior to repeating operations (a) through (c).

36. An apparatus as recited in claim 35, wherein at least one of the processors and memory are further adapted for:

adding any re-classified defects into the seed defects even when all defects within the representative set of defects from each probable class have a same class;

presenting a representative set of suspected misclassified defects to the user for possible re-classification when all defects within the representative set of defects from each probable class have a same class; and

classifying the non-reviewed defects based on the manual classification and re-classification defects of each probable class.

37. An apparatus as recited in claim 31, wherein at least one of the processors and memory are further adapted for:

determining a confidence level for each non-reviewed defect in each probable class; and

selecting the non-reviewed defects from each probable class which have the lowest confidence level for inclusion in the representative set for such probable class.

38. An apparatus as recited in claim 31, wherein at least one of the processors and memory are further adapted for when there is manual classification present and:

when there is a training set of classified defects for classifying unclassified defects present, using the training set as reference defects to detect new defects in other non-reference defects;

when there is not a training set of classified defects for classifying unclassified defects present, using the classified defects as reference defects to detect new defects in other non-reference defects;

when new defects are found, grouping the new defects and presenting to the user for classification; and

when new defects are found, repeating operations (a) through (c) after the new defects are classified.

39. An apparatus as recited in claim 31, further comprising creating a classifier system for classifying unclassified defects when the user selects an option for creating the classifier system, wherein creating the classifier system comprises:

repeating the operations for grouping, presenting the representative set from each group; and operations (a) through (c), wherein the classified defects are

used as seed defects for classifying unclassified defects as part of the classifier system, when the user selects a supervised mode;

using at least a portion of the classified defects as training defects for classifying the rest of the defects as part of the classifier system when the user selects using existing manual classes mode; and

using a grouping procedure for assigning manual class codes to the defects and then using a portion of the defects as training defects for classifying the rest of defects as part of the classifier system when the user selects an unsupervised mode.

40. An apparatus as recited in claim 39, wherein at least one of the processors and memory are further adapted for:

when using existing manual classes mode is selected, presenting purity and accuracy matrices for a classifier based on (1) existing training defects, (2) a training set selected using the max/min algorithm (3) a training set combining the existing training set and a training set selected using the max/min algorithm; and

creating a classifier based on the user's selected from among the three classifiers.

41. An apparatus as recited in claim 38, wherein the grouping procedure is a natural grouping procedure.

42. A computer program product for setting up an automatic defect classifier system for classifying semiconductor defects, the computer program product comprising:

at least one computer readable medium;

computer program instructions stored within the at least one computer readable product configured for:

providing defect image data;

grouping the defect image data into a plurality of groups of one or more defects;

selecting a representative set of defects from each group so as to optimize manual classification; and

presenting the representative set of defects from each group and not the defects which are not part of the representative set from each group to a user for manual classification, wherein the defects which are not part of the representative set from each group are defined as non-reviewed defects.

43. A computer program product as recited in claim 42, wherein the computer program instructions stored within the at least one computer readable product further configured for:

(a) determining a probable class for each non-reviewed defect based on the manual classifications by the user;

(b) determining a representative set of defects from each probable class which include defects having a probable class with a lowest confidence level within such probable class;

(c) presenting the representative set of defects from each probably class to the user for possible re-classification; and

(d) repeating steps (a) through (c) until all defects within the representative set of defects from each probable class have a same class, wherein

the repetition of the determination of the probable class is based on the manual classifications and the re-classification by the user.

44. An apparatus as recited in claim 42, wherein the computer program instructions stored within the at least one computer readable product further configured for: maintaining a classifier by merging existing classifiers together, adding new type of defects into the classifier, adding new boundary defects into the classifier, and removing redundant defects from the classifier.